Amendments to the Claims

I have amended the Claims 1, 2 and 3 and added a new Claim 13. The 4 claims are independent and I have cancelled Claims 4 through 12.

The claims have been rewritten with the patent lawyer help.

Clean copy first

Amended copy second

Claims

1. (currently amended): A system to actively manage pressure and eliminate non-condensable gases, like air, from a solar collector to a hot water tank, antifreeze fluid filled, heat transfer loop, during every heat up and cool down cycle, which comprises: a pressure relief valve placed at the highest point in the system immediately above the solar collector; a pressure relief valve capable of maintaining the pressure, caused by fluid thermal expansion or water to steam phase change, above atmospheric pressure, thereby increasing the boiling point of the heat transfer fluid; a non pressurized overflow/recovery reservoir beyond the pressure relief valve apparatus to catch overflow heat transfer fluid and release non-condensable gases to the atmosphere; a vacuum relief valve, in parallel with the pressure relief valve, connected to the overflow/recovery reservoir below the water line, so fluid thermal contraction induced vacuum inside the fluid loop returns only the overflowed fluid to the fluid loop while keeping non-condensable gases out.

2. (currently amended): A boiling activated solar collector over-temperature protection system for pressurized, antifreeze filled, fluid heat transfer loop from a solar collector to a hot water tank, which includes a condensable gas (steam) heat pipe to carry excess heat from the boiling solar collector up to a pressurized fluid-to-outside-air-radiator, which comprises: a steam liquid separator between the solar collector and radiator to allow condensed steam, i.e. water, to flow back to the solar collector from the radiator, while allowing steam to pass from the solar collector to the radiator; a radiator above the solar collector in which the pressurized steam condenses giving up its heat of vaporization and this heat is conducted via fins to the outside-air, while keeping the condensed water inside the pressurized fluid loop; a means to keep condensable gases, like air, out of the fluid loop; a means to pressurize the fluid loop.

3. (currently amended): A pressure activated solar collector over-temperature protection system for pressurized, antifreeze filled, fluid heat transfer loop from a solar collector to a hot water tank, which utilizes solar collector air dampers as moving parts to allow outside air to flow over and cool the solar collector absorber plate, which comprises: a steam

pressure activated mechanical actuator, which opens solar collector air damper valves before the system's regulated pressure is reached; a means to regulate maximum pressure in the fluid heat transfer loop; a set of damper valves, which control airflow over the solar collector heat absorbing panel, so when the air dampers are opened the sun's heat energy is dissipated to the ambient air flowing over the heat absorbing panel and when the dampers are closed the sun's heat energy is delivered to the heat transfer fluid within the solar absorbing panel.

4. (cancelled):

5. (cancelled):

6. (cancelled):

7. (cancelled):

8. (cancelled):

9. (cancelled)

10. (cancelled)

11. (cancelled)

12. (cancelled)

13. (new) A boiling activated solar collector over-temperature protection system for pressurized, antifreeze filled, fluid heat transfer loop from a solar collector to a hot water tank, which includes a condensable gas (steam) heat pipe to carry excess heat from the boiling solar collector up to a pressurized fluid-to-outside-air-radiator, combined with a pressure activated solar collector over-temperature protection system for pressurized,

antifreeze filled, fluid heat transfer loop from a solar collector to a hot water tank, which utilizes solar collector air dampers as moving parts to allow outside air to flow over and cool the solar collector absorber plate, which includes an active pressure control system and an air elimination system.

Claims

1. (currently amended): A system to actively manage pressure and eliminate non-condensable gases, like air, from a solar collector to a hot water tank, antifreeze fluid filled, heat transfer loop, during every heat up and cool down cycle, which comprises: a pressure relief valve placed at the highest point in the system immediately above the solar collector; ~~self pressurized, by fluid thermal expansion or phase change (water to steam), fluid filled closed loop solar collection system for delivering solar energy from a roof mounted collector panel to a hot water tank including:~~ a ~~pressurization~~ pressure relief valve~~system~~ capable of maintaining the ~~system~~ pressure, caused by fluid thermal expansion or water to steam phase change, above atmospheric pressure,~~s~~ ~~above atmospheric pressure to increase~~thereby increasing the boiling point of the heat transfer fluid; ~~a pressurized fluid radiator/~~a non pressurized overflow/recovery reservoir beyond the pressure relief valve apparatus to catch overflow heat transfer fluid and ~~trapped~~ release non-condensable gases to the atmosphere; ~~air and~~ vacuum relief valve, in parallel with the pressure relief valve, connected to the overflow/recovery reservoir below the water line, so ~~return the fluid to the system by~~ fluid thermal contraction induced vacuum inside the fluid loop returns only the overflowed fluid to the fluid loop while keeping non-condensable ~~air~~ gases out~~;~~. ~~a heat transfer fluid to air pressurized radiator and or solar collector pressure activated air dampers to prevent the solar collectors from overheating during no flow conditions; a water based antifreeze heat transfer fluid to prevent damage from freezing in winter environments; a flexible umbilical to connect solar collector and water tank heat exchanger together; a circulation pump; control system and an internal heat exchanger which is adaptable to the hot water tank, to deliver heat from the heat transfer fluid to the hot water tank.~~

2. (currently amended): A boiling activated ~~pressurized radiator~~ solar collector over-temperature protection system for pressurized, antifreeze filled, fluid heat transfer loop from a solar collector to a hot water tank, which includes a condensable gas (steam) heat pipe to carry excess heat from the boiling solar collector up to a pressurized ~~fluid~~ fluid-~~to~~ to-outside-~~air~~ air-radiator, which comprises: a steam liquid separator between the solar collector and radiator to allow condensed steam, i.e. water, to flow back to the solar

collector from the radiator, while allowing steam to pass from the solar collector to the radiator; a radiator above the solar collector in which the pressurized steam condenses giving up its heat of vaporization and this heat is conducted via fins to the outside-air~~/~~, while keeping the condensed water inside the pressurized fluid loop; a means to keep ~~overflow/recovery apparatus to catch overflow heat transfer fluid and trapped air and return the fluid to the system using vacuum while keeping~~ condensable gases, like air, out of the fluid loop~~, utilizes no moving actuators, and includes a boiling gas/liquid separator, which allows steam condensed in the pressurized liquid to air radiator to be kept in the pressurized fluid loop,~~ ; a means to pressurize the fluid loop.

~~so the sun's heat energy is dissipated to the ambient air flowing over the pressurized radiator and when the collector boiling stops, the sun's heat energy is delivered to the circulating heat transfer fluid and then to the hot water tank.~~

3. (currently amended): A pressure activated solar collector over-temperature protection system for pressurized, antifreeze filled, fluid heat transfer loop from a solar collector to a hot water tank, ~~A pressure activated solar collector over-temperature protection system~~ which utilizes solar collector air dampers as moving parts~~, including~~ to allow outside air to flow over and cool the solar collector absorber plate, which comprises: a steam pressure activated mechanical actuator, which opens solar collector air damper valves before the system's~~'~~ regulated pressure is reached; a means to regulate maximum pressure in the fluid heat transfer loop; ~~and~~ a set of damper valves, which control airflow over the solar collector heat absorbing panel, so when the air dampers are opened the sun's heat energy is dissipated to the ~~flowing~~ ambient air flowing over the heat absorbing panel and ~~then~~ when the dampers are closed the sun's heat energy is delivered to the heat transfer fluid within the solar ~~circulating heat~~absorbing panel ~~transfer fluid and thus to the hot water tank~~.

4. (cancelled-):

5. (cancelled): ~~The system as in claim 1 comprised of a 220/115 VAC controller and pump and boiling activated over-temperature protection.~~

6. (cancelled-): ~~The system as in claim 1 comprised of a 220/115 VAC controller and pump, with pressure activated over-temperature protection.~~

7. (cancelled): ~~The system as in claim 1 or claim 2 comprised of a a photovoltaic panel and low voltage (12VDC) pump, with boiling activated over-temperature protection.~~

8. (cancelled):

~~The system as in claim 1 or claim 3 comprised of a photovoltaic panel and low voltage (12VDC) pump, with pressure activated over-temperature protection.~~

9. (cancelled) ~~The system as in claim 2 comprised of a 220/115 VAC controller and pump and boiling activated over-temperature protection.~~

10. (cancelled) ~~The system as in claim 3 comprised of a 220/115 VAC controller and pump, with pressure activated over-temperature protection.~~

11. (cancelled) ~~The system as in claim 2 comprised of a a photovoltaic panel and low voltage (12VDC) pump, with boiling activated over-temperature protection.~~

12. (cancelled) ~~The system as in claim 3 comprised of a photovoltaic panel and low voltage (12VDC) pump, with pressure activated over-temperature protection.~~

13. (new) A boiling activated solar collector over-temperature protection system for pressurized, antifreeze filled, fluid heat transfer loop from a solar collector to a hot water tank, which includes a condensable gas (steam) heat pipe to carry excess heat from the boiling solar collector up to a pressurized fluid-to-outside-air-radiator, combined with a pressure activated solar collector over-temperature protection system for pressurized, antifreeze filled, fluid heat transfer loop from a solar collector to a hot water tank, which utilizes solar collector air dampers as moving parts to allow outside air to flow over and

cool the solar collector absorber plate, which includes an active pressure control system and an air elimination system.